



Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at <http://about.jstor.org/participate-jstor/individuals/early-journal-content>.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact support@jstor.org.

ON THE DISTRIBUTION OF COLOR-MARKS IN THE PTEROPODIDÆ.

BY HARRISON ALLEN.

In a paper which I contributed to these Proceedings, 1888, p. 84, I endeavored to establish the proposition that the arrangement of the fur and the markings upon the skin in the mammalia were capable of being systematically treated. Especially I endeavored to correlate the location of color-marks with physiological or morphological factors. Thus some of the markings are due, it is thought, to effects of heat and moisture, others to the presence of important glands, or of special organs; a third group was explained on the basis of bi-lateral symmetry, etc.

The essay now presented is confined to the further elucidation of the subject, as illustrated in the fox-bats. Conformation to a general type of coloration is here easily discerned. While writers have mentioned some of the details, no evidence is presented why they may not constitute the plan upon which descriptions of species should be based. That some plan is needed is evident. In no group of mammals is it more difficult to identify species where no assistance is afforded by the examination of types or of collections which are authoritatively named. I hope that this difficulty may be lessened by mapping out the hair-bearing surfaces into regions, and by separately describing each. The study of variable species is one of the most interesting phases of modern zoology; the time has come apparently to devote greater care than has been the custom to the most variable of all the characters of the mammalia, namely, the quality, coloration, and distribution of the hair. This explanation is necessary to account for the minute description of well-known forms of bats in the ensuing pages.

The regions which will receive names in the descriptions are as follows:

The crown.

The face.

The "whisker."

The inter-ramal space, i. e.—the region between the horizontal rami of the mandible.

The post-mental space, i. e.—the space directly back of the mentum.

The occiput.

The side, the front, and the back of the neck.

The base of the prebrachium.

The side, the front and the back of the trunk.

The rump, the lower part of which forms the sacral region.

The infra-anal region or the space below the anus.

The *crown* may be said to extend back as far as the ears.

The *occiput*, to reach from the crown to the end of the curve from the crown to the neck.

The *face* (exclusively of the dorsum of the muzzle) commonly has the hair directed in varying degrees backward. The face may be naked except in clumps, or lines which will receive names according to their locations.

The "*whisker*" is the growth of hair which lies in front of the auricle. It connects the hair of the crown with that of the side or the front of the neck and the space between the rami. The hair of the face, when directed backward often slightly overlaps the "*whisker*."

The *space between the rami* is either of the color of the crown, face or of the front of the neck. As a rule it is a feebly developed region.

The *post-mental* space is a subdivision of the foregoing.

The *side of the neck* is an important region since the hair is here, as a rule, longer and coarser than elsewhere. The clumps usually described as "*shoulder tufts*," belong to the side of the neck. But the tufts are rarely differentiated. They are well seen in *Cephalotes peroni* and *Cynopterus marginatus*. In most examples the entire cervical region is occupied with hair of a special character and, as already remarked, may be continuous with the hair in front of the auricle.

The hair of the *front of the neck* in marked contrast to that of the side is almost always thinner and softer and may be almost absent. Of a shade in common with that of the side it is often of a hue which results from a mixture of this shade with that of the front of the trunk or space between the rami.

In like manner the *back of the neck* is a weaker region than the side. Usually marked with the same colors as the side it may be continuous with that of the back of the trunk or of the occiput.

The *base of the prebrachium* is not to be confounded with the lower part of the side of the neck where it forms the so-called shoulder-tuft. The hair usually forms a clump on the ventral side of the prebrachium near the shoulder. It may be an extension of the color

of the side of the neck, of the side of the front of the body, or be a special development.

The *side of the trunk*, next to the side of the neck, is the most important region. It appears to be controlled by the position of the mamma, since the tract begins at the upper border of the gland. In *Cynopterus marginatus* it is confined to the region of the mamma. It extends in all forms, other than the one named, the entire length of the trunk, becomes woolly and is lost on the inguinal, femoral or crural regions. This tract appears to be the same as the region for the colors on the flanks and inner surfaces of the legs of quadrupeds generally. It is undoubtedly sexual in significance, for in addition to its relation to the mamma it lines the depression between the sides of the body and the wing-membrane and forms a sort of pouch in which the young are carried. The hair is uniformly soft and silky.

The hair of the *front of the trunk* is shorter than that of the side, and usually of varying contrasted shades of color.

The *back of the trunk* begins at the level of the prebrachia, usually by a sharply contrasted line with the back of the neck; but it may be continuous with that of this region as in *Cynopterus*, or be separated therefrom by a vertebral stripe, as in *Harpyia*, or by a narrowed tract, as in *Pteropus melanopogon*. When hairless (in the adult), as in *Cephalotes*, the region is still sharply limited by the lines of the prebrachia.

The *region of the sacrum* is conveniently separated from that of the back since hair may be retained here when it is absent or rudimentary elsewhere, as in *Cephalotes* and *P. melanopogon*.

The "rump" includes the region last named and the loin.

The *infra-anal* region is not separated by any limit from the side of the trunk but it is sometimes useful to speak of it distinctively.

The shades on a single hair whether unicolored, or having the tip of a different color from the shaft, or the base of a different color from the shaft or tip, is always to be noted. The hair which extends from the body to the auricles, the wing-membranes and the interfemoral membrane, is uniformly unicolored. The arm may be an exception, when it is covered with the hair of the front of the trunk. The hair at the front of the crown and sides of the face is generally unicolored, as also is the "whisker." On the side of the neck the hair may be unicolored when elsewhere the hair is bi-colored.

The presence of circumpalpebral hair of contrasting color with the rest of the head, or of special patches of color about the eyes, which contribute such conspicuous features in many other quadrupeds, appear to be absent in the Cheiroptera. An apparent exception may be made in the instance of *P. capistratus*; but in this species the hair about the eyes embraces a wide region and if it receives the name circumpalpebral, this word must be in a different sense from the one previously employed in the essay on color-marks.

The white patches of hair at the base of the auricle and at the shoulder which are so note-worthy in *Epomophorus* do not appear to be generally retained. As already mentioned the clump last named is a differentiation of that of the side of the neck.

The enormous development of the wings dominates nutritive processes at the side of the body. With these changes the greater development of the hair—coarse, as in *Pteropus*, or long and soft, as in the order generally—appear to harmonize. The position of the mamma at the side of the pectoral region also assists in determining the tendencies to lateral developments if we can so conclude from the line of soft, long fur which is so commonly found beginning about the mamma and extending down to the thigh. The prebrachium is distinctly ventral in its relations (for the association of the so-called occipito-pollical muscle in some forms, as in *Molossus*, is more pectoral than napal) and the coloration of the base of the skin-expanse naturally partakes of the shades of color of the chest and abdomen.

The woolliness of the hair at and below the anus and at the sacrum is not explicable. It may be in some way associated with the generative acts.

Pteropus edwardsii.

An adult male.

Crown paler than the back of neck; it is narrowed to a point between the eyes.

Base of the auricle with a clump of dark brown (almost black) hair. Directly in front of the auricle is a broad band of hair (the “whisker”) which unites the crown with the hair of the side of the neck.

Circum-palpebral patch black, faintly defined.

Cheek-patch black, distinct.

Labial hairs black, highly developed at the ricti.

Post-mental patch black, distinct.

The side of the neck with long, coarse, unicolored, reddish hair, the longest of any in the body excepting that of the side of the trunk.

The front and back of the neck like the side, but the hair is less red and shorter. The hair is blackish at the basal third or fourth.

The side of the trunk about the mamma, with long silky, black unicolored hair. This tract is continuous with that of the outer side of the leg and wing membranes where it becomes shorter and thinner.

The abdomen and the base of the prebrachium almost entirely black but with glistening yellowish tips which partially conceal the black color of the shafts. The hair is less silky than at the sides. The base of the prebrachium is of a brighter yellow than is the abdomen.

Below the anus and on the inner side of the leg the hair is woolly, black with grizzly tips.

The back is black, hairs short, appressed, becoming longer woolly and grizzly at the sacrum and on the legs.

The margin of the endopatagium with a faint line of short black hairs.

Pteropus vulgaris.

(1) An adult.

Crown and nape, and tract, in front of the auricle, dark chestnut-brown. The crown-patch advances beyond the eyes. No separate clump at the base of the auricle.

Circumpalpebral patch is of the same color as the crown and nape. The crown is unicolored; the nape is bi-colored, the basal fifth being black.

Face uniformly covered with short, brown hair without distinct cheek-patch.

Labial hairs brown, well developed.

Post mental patch, black, distinct, and continuous with the hair of the front of the neck.

Side of the neck with very long silky, black hair.

Front and back of the neck with hair of the same character but shorter; that of the front is shorter than that of the back.

The side of the trunk also with exceedingly long black, silky unicolored hair. Some of the hairs are lightly tipped with gray.

The front of the trunk with short, black, unicolored hair.

Base of prebrachium black, as in the neck.

Arm, forearm and wing-membrane brown.

Below the anus the hair is also brown; it is woolly in texture.

The *back* is brown with black at basal fourth. The hair of this tract where it extends on the wing-membrane, is silvery-yellow. The same color characterizes the hair of the extremities.

Endopatagial hairs are conspicuous on the margin of both dorsal and ventral surfaces.

(2) An Adult.

The hair as above with the exception that the color on the side of neck, side of trunk, back and front of neck, and of chest and abdomen is brown instead of black.

Pteropus rubricollis.

Three adult skins.

(1) In no region is the hair differently colored at shaft and base. The *crown*, *nape* and *whisker* with long, erect, unicolored gray hair. The anterior portion of the crown advanced beyond the eyes well on the nose.

The *cheek* covered with hair of the same character which is continuous with the above. The ear is covered with hair on both sides.

Circum-palpebral patch black or gray.

Labial hairs well developed, black.

Post-mental patch large, black and continuous with the hair of the front of the neck.

Side of neck, which has a distinctly ventral inclination, is covered with very long silky, hair of a tawny yellow—the tips being chestnut-brown. The patch does not extend to the shoulder nor scarcely to the back and front of neck, where the hair is more brown.

The shoulder and base of prebrachium is occupied with an equally long patch of black hair which is continuous with the *side of the trunk*. This line closely resembles that seen in *P. vulgaris* in having the hairs with ashy tips.

The chest and abdomen of the same general color as the sides of trunk but more gray.

The *hair of the wing-membranes* brownish, with gray tips.

The *back* is covered with long, black, silky hair with ashy tips. The tract advances well up on the neck, and the color of the side of the neck dominates scarcely at all the color of the dorsum or ventre. The expansion of the hair on the wing-membranes at the endopatagium is of the same color as the back of the trunk, thus presenting a marked contrast with the disposition in *P. vulgaris*, or is of a dull iron-gray. Gray hair covers the humerus and the fleshy part

of the forearm. The fur over the *sacrum* is not differently colored from that of the back.

The fur below the anus is long, gray, unicolored, and forms a conspicuous mass of hair between the thighs.

The *thighs* are clothed to a point nearly to the ankle with tawny-brown, or gray fur.

Posteriorly the posterior extremity is covered to the base of the metatarsus, or to the bases of claws, with hair of the same color.

(2) An adult skin.

The color essentially the same as above. The crown is of a dark iron-gray color. The color of the side of the neck distinctly dominates the back of the neck as well as the front.

P. edwardsii, *P. vulgaris*, *P. rubricollis* being all from the same localities, viz., Madagascar, the following statements respecting them may be useful :

In all the crown is distinct from the neck ; the cheek hairy ; the whisker is present ; a disposition exists for the circumpalpebral hair to be distinct ; the labial hairs are abundant and of black color ; the color of the side of the neck not markedly dominating that of the back or the front ; the side of the trunk distinctly differentiated.

P. rubricollis is different from the other species, inasmuch as the hairs are not dark at the base and (with the exception of the tips) are of the same color their entire length.

Pteropus edulis.

Seven specimens examined.

(1) An adult skin (No. 2745).

Crown black with dark red tips. The patch extends well between the eyes.

Base of *auricle* naked.

“ *Whisker* ” narrow,—confined to a rather small tract, which meets the backward directed black hair of the face to form a “cowlick.”

Cheek patch is absent.

Labial hairs inconspicuous, scarcely differentiated from those of the face.

Circumpalpebral patch absent.

Side of neck with long, stiff, unicolored, reddish hair distinctly dominating the back of the neck to form a mantle, but yielding to the ventral colors on front of the neck.

Post-mental tuft of black hair conspicuous. Black hair extends on the face and the neck as far back as the line of the ears.

The base of the prebrachium and the chest thence to the middle of the ventre of a peculiar dusky shade of color which appears to be intermediate between the color of the side of the neck and that of the chest and abdomen.

The side of trunk with long soft black hair with ashy tips; it is more woolly than on the chest and abdomen.

The back is occupied by a narrow tract of appressed, black hair with grizzled tips.

Sacrum iron-gray,—same color of fur extends on the posterior extremities to the upper third of the legs. The texture is distinctly woolly.

The chest and abdomen covered with short slightly woolly hair of a dark smoky black color with ashy tips.

The hair below the anus does not differ from that of the abdomen. A few hairs are seen on the dorsal surface of the endopatagium.

(2) Adult skin. (No. 6538.)

As in preceding. The crown is more red, the black hair of the neck below the mandible forming a long distinct "cowlick" in the middle, and extending back on the line of the ears. Line of side of neck with basal plumbeous color.

No intermediate color between the mantle and the color of the chest and abdomen.

The bases of the hairs dark plumbeous on the crown and back of mantle.

(3) Adult skin. A male (No. 6541).

Red color extending entirely over the crown, below the eye and by a broad "whisker" to the surface between rami of the mandible. The black color of the face is confined, indeed, to the muzzle. The nape of the neck and the mantle is of a much lighter shade of red than the side of the neck and the crown. The shafts of the hair everywhere unicolored.

(4) Young adult skin. A male (No. 3668).

The black shades prevail. The crown, sides of face, front of neck, hair on humerus, space between the mandibular rami, being this color. The black hair of the abdomen tipped with brown instead of gray.

Pteropus maklotii.

An adult skin.

Crown of head tawny, the basal half being black.

"*Whisker*" black, as is also the neck between the horizontal rami of the lower jaw.

Face black sparsely covered with hair.

Labial fringe none.

Side of neck distinctly limited from the back and front. Hair longer and coarser than elsewhere. The basal half tawny, the apical half black with glistening ashy tips.

Back of neck uniform dark brown.

Front of neck black with glistening ashy tips.

Side of trunk with long silky black fur with ashy tips.

Front of chest and abdomen same in color but much shorter and stouter.

Back covered with uniform dark brown, appressed hair.

Over sacrum same, but more woolly and with ashy tips.

Base of prebrachium not distinctly colored from the humerus, both being dark brown.

Pteropus medius.

Nineteen skins.

(1) *Crown* dark brown, basal third much darker. Hair almost appressed.

"*Whisker*" well defined but not forming a "cowlick" with the black hair of the face.

Labial fringe absent.

Hair between the horizontal rami of the lower jaw thick and soft, and of a black or deep brown color.

Side of the neck with long, thick fur of a tawny or yellow tinge. Basal half black.

Back of neck the same. The lower margin of the mantle is of a lighter hue than the rest.

Base of prebrachium anteriorly (ventrally) clothed with short hair which is of the same color as the humerus, namely, very dark brown or black.

Side of trunk with very long silky black hair. Base of the same hue as the tips.

Front of chest and abdomen dull chestnut-brown. Basal half black.

Region below anus woolly, dark brown.

Back with short appressed hair, dark brown to black with gray tips.

Sacrum and legs woolly with same color as the back.

(2) Same as No. 1.

Crown more blackish ; base of prebrachium same color as mantle.

(3) Same as No. 1.

Crown and mantle everywhere tawny, no yellow tints on body.

Chest and abdomen and base of prebrachium tawny throughout.

(4) Same as No. 1. (smaller, probably immature).

Crown rich chestnut.

Back of neck (mantle) light-yellow verging to a paler hue.

Base of prebrachium the same as back of neck.

Side of neck, front of neck and shoulder at base of humerus light chestnut.

Front of *chest* and *side of trunk* much the same but intermixed with black points.

Back with many dark chestnut points to the prevalent black hair.

(5) Same as No. 4.

Front of *chest* and *abdomen* nearly black.

In *P. medius* it is clearly seen that the basal dark shades are more persistent than the tips. The region of the crown becomes variable as the chestnut and brown tips disappear and permit the basal dark shades to show and give various effects to the general color of the region. The back seems to be composed of the basal black—the entire length of the hairs being about equal to the dark portions of the hair of the side of the neck and of the mantle.

In group No. 4. the prevalence of the lighter chestnut or yellow shades are substitutions for the tip-colors only for the darker brown or black of the other groups—with the exception of the base of the prebrachium, where the hair is entirely yellow, as in group 3 it is entirely tawny.

Pteropus poliocephalus.

Six skins of adults.

Crown and face and region between the horizontal rami of mandible dark gray. Hair in front of the ear thicker than elsewhere and verging to black. No basal contrast. The hair is thick and long except on the face.

Labial fringe absent.

Side of neck with very long and soft chestnut-colored hair. The base is black.

The front and back of the neck is of the same general character. The contrast between the parts and the side of the neck less noticeable than in other species examined.

Base of prebrachium black and distinctly differentiated from the fur of the surrounding regions.

The side of the trunk slightly more fulvous than the rest of the chest and abdomen where the hair is of a uniform gray tint as the head. The arm thickly covered with fur of the same character.

With the exception of becoming more woolly the hair of the region of anus, that below the anus and on the legs is of the same color.

The back covered with appressed hair, but unusually long and soft.

That over the lower sacrum and legs precisely the same as that of the body.

There is a faint hem of hair on both surfaces of the free margin of the endopatagium.

Remarks: The confluence of the crown, whisker, face, and region below the lower-jaw—in one color district; the merging of the side of the neck with the front and back; the imperfect differentiation of the color of the side of the trunk from that of the chest and abdomen; the exact resemblance between the front and back of the body and legs, readily distinguishes this species from any examined. With the reduction of the color-regions to three, namely, the head, neck, and body, the retention of the black tuft of hair at the base of the prebrachium is remarkable.

Pteropus melanopogon.

Twenty-four specimens of the skin of this variable form were examined, four of these were identified as male and nine as female. The remainder were undetermined, nine of this remainder were immature.

The specimens will be examined under these heads:—

(1) Two individuals, male. *Crown* to a little beyond the eyes unicolored black; the rest of crown chestnut at tips—the shaft and base being black.

Nape of the neck unicolored red-yellow.

“*Whisker*” unicolored, same color as nape.

Face with tendencies to growth of reddish black hairs with black base on the cheek, lower eyelid and malar bones and along the horizontal ramus of the lower jaw. Between these localities the skin is nearly naked.

The *space between the horizontal rami* covered with short hair of the color as the above.

The side of neck with long yellow, red unicolored hair, but slightly differing from that of the back. The hair only with black base as it joins the hair of the back.

The front of the neck sharply separated from the side in color and texture. It is less compact, unicolored dark reddish-brown much softer.

There is no differentiation at *base of prebrachium*.

Chest and abdomen uniform dark brown, unicolored.

The side of the trunk softer but scarcely longer, unicolored, almost cinereous.

The infra-anal region more woolly.

Back dark brown hairs closely appressed.

The sacrum and parts beyond distinctly woolly.

(2) Two specimens. Apparently old individuals.

No black on *crown*. Fur everywhere tawny verging in places to light chestnut red, excepting the back of the body which is sulphur yellow.

(3) One female. *Crown* covered with brown hair having glistering yellow tips.

"*Whisker*" long, yellow, unicolored.

Clumps on the face (beneath eyes and on cheek) dark brown unicolored.

Side of lower jaw, including masseter muscle, dark brown unicolored.

The thinly distributed long tawny hair of the *front of neck* invades the space between horizontal rami of the lower jaw—the *post mental space* alone being covered with a clump of brown unicolored hair as on lower jaw.

Side of neck with slightly longer hair than the back, but of the same tawny yellow, no well defined line separating the two regions.

The *base of prebrachium* on ventral surface, dark brown, the humerus tawny yellow, axilla and side of the trunk dark brown. Therefore three colors are seen at side of body from the upper margin of ventral aspect of the prebrachium to the axilla. The resemblance to the same parts in *P. medius* is close.

Side of trunk long, silky, dark brown, unicolored.

Chest and abdomen light brown, unicolored.

Infra-anal region scarcely woolly, same color as above, a conspicuous cowlick at the median line at the interfemoral membrane.

Back composed of a narrow tract of appressed, tawny, yellow hair with brown marginal lines which extend to knees.

Prebrachium entirely naked on dorsal surface.

One specimen only retained a few hairs on dorsal surface of the ulna.

(4) One female. Uniform dark tawny brown everywhere except along the *back of the body* which is sulphur-yellow.

The *side* of sorrel color and extending thence to the knees of the same brown shade as in group No. 1.

No "cowlick" on front of the interfemoral membrane.

(5) Two individuals, sexes not determined.

Crown dark unicolored brown.

Face, with the exception of a naked space between the eye and the cheek, covered with the same brown hair.

"*Whisker*" well defined but partially concealed by a prominent cowlick which is formed by the whisker and the backward directed hair of the side of the face.

Inter-ramal space, or the space between the horizontal rami of the mandible the same as the face and the crown.

The fur of the *front of neck* dark brown and sharply separated from that of the side of the neck as in group 1 of the males; yet the base of the prebrachium is arranged as in group 1 of the females.

The *fur of the back* of body dark brown with nearly black lateral lines.

(6) Nine immature examples.

(a) Seven of these were two-thirds grown, (b) one was about half grown, and (c) one with head and body measuring but six inches.

Group (a). This exhibited the general arrangement of colors and of fur as in the adults. The fur everywhere was silky. The hair of the back in all examples save one was of a rich olive-brown. The exception showed the sulphur-yellow of the adult male.

In example (b) the fur was everywhere dark brown excepting at the occiput where it was a shade lighter.

In example (c) the hair was of uniform light brown. The hair excepting that of the side of neck was scarcely differentiated either in color or length.

In all the nine individuals the skin over the dorsal aspect of ulna was covered with a distinct narrow tract of hair. In the adults with but a single exception this line was absent.

The crown tends to be very dark brown and unites with the side of the face and the inter-ramal space by a tract—the “whisker”—which extends between the ear and the eye. The color of the crown is usually abruptly contrasted with that of the occiput. The space between the eyes may be retained as a narrow patch of dark brown which is nowhere else seen upon the crown. The occiput is almost uniformly of a bright color. The back of the neck is chestnut and forms occasionally only a collar. The sides of the trunk are apt to be differently shaded from the front, *i. e.*, they are either lighter or darker than the front. The region of the pelvis both front and back is almost uniformly woolly and darker than the adjacent fur on the loin and the abdomen.

In twenty examples the crown of the head, side of face and under part of the head at the mandible tend to be differentiated from the rest of the body. The whisker is marked excepting in the very young. The side of the neck is less distinctly developed, yet the tendency for it to be so is seen in young individuals but six inches in length. The front of the neck is often sharply contrasted in color with that of the side—a peculiarity not seen in any other species examined. The nape of the neck is apt to be of a lighter color than any other portion of the body. The differentiation at the base of the prebrachium is of a variable tendency. The hair of the side of the body is relatively less long than in other species. The sulphur-yellow color of the back of the body is more marked in the female than in the male as is the disposition for the hair of the infra-anal region to be furnished with a “cowlick”. The side of the tract on the back tends to be margined with hairs of a different hue from the one which is prevalent, as in *P. vulgaris*. The presence of a small tract of hair on the dorsal surface of the ulna in one adult only while it is detected in all the nine immature forms is a fact of interest.

The naked patches on the face answer nearly to the lines of dark hair on the face in *P. capistratus*. The anterior part of the dark crown in some varieties is precisely of the nature of a median dorsal stripe and appears to be identical with the stripe similarly situated in the species last named.

Pteropus capistratus.

Of this species fifteen specimens were examined, five of these having a length of forearm of 100 mm. to 105 mm ; seven of 65 mm. to 80 mm. and three of 50 mm. The three last named were certainly immature.

(1) *Crown* with median black line, the remainder being white. The black line distinctly divided anteriorly on dorsum of muzzle. The eye surrounded with white hair which is directed backward and merges into that of the crown.

An oblique black line extends across the *face* from near the inner canthus to the angle of mandible. Directly in front of the whisker a vertical black line extends. It broadens slightly and merges with the black of the front of the neck and space between the horizontal rami of the lower jaw. In the space last named the hairs are arranged in the form of two lines with a white space between.

Side of neck white not longer than back. The occiput yellow-white.

Base of hair of *occiput, side, front and back of the neck* black. The white hair of the crown and the side of face including the whisker unicolored.

No differentiation at the *base of prebrachium*.

The color of the *chest* and *abdomen* dark brown with ashy or pale yellow-white tips. Side of body or color of arm scarcely differentiated. The space about nipple nearly naked (sexes not distinguished).

Back much the same, but hair slightly appressed. Margin lighter as in *P. vulgaris*. Sacrum and legs to ankle markedly woolly.

Free margin of endopatagium hairy ; white hair on dorsum, arm and forearm.

(2) Same as above with white tips supplanting the yellow-white of the nape of the neck and the occiput.

(3) Same as above, everywhere darker, the base of the hair becoming conspicuous owing to the partial absence of the apical white. Black lines on the face absent except the median dorsal of the crown. The whisker light, uniform gray. The hair about eye and on crown is also gray but darker than the foregoing and is furnished with a dark brown base. The dark brown of the space between the horizontal rami of the mandible confined to the postmental space.

(4) The very immature individuals have entirely white hair on back of neck.

As already noted the lines on the face are essentially the same as the naked spaces in *P. melanopogon*. The white color approaches the borders of the eye-lids—a narrow line of integument alone intervening. No collar of black hair at this place discerned.

The wing membranes are marked by numerous irregular lines as in *Harpyia*.

***Cephalotes peronii*.**

Five examples of this species were examined.

In two of the number, (*a* & *b*) the forearm measured 111 mm. in length; in one (*c*) the forearm measured 75 mm.; in one (*d*) (certainly immature) the forearm measured 80 mm.; and in another (*e*, also immature) it measured 65 mm.

(*a*) The *crown* and *occiput* black.

Face sparsely covered with short black hair which for the most part is directed backward and reaches almost to the ear, so that the “whisker” tract is obscurely defined if it be present at all.

The *side of neck* provided with sparsely distributed hair. The part near the shoulder with an obscure rosette-like arrangement of unicolored olive-brown hair. The front of the neck is covered with short hair of the same color which appears to be on each side an extension of the rosette upward and to the front of the neck.

The *back of neck* is of the same color with that of the occiput and crown but of a lighter shade.

The hair is distinctly longer than on the side and is easily distinguished therefrom by its darker hue.

A row of long, very distinct bristles is present on both the upper and lower lips. The bristles of the muzzle and above the eye are also exceptionally conspicuous.

The *side of the trunk* is distinctly separately marked from the front. The hair is of a unicolored mouse gray color, long and silky. It is continuous without interruption to the infra-anal and femoral regions.

The hair of the *front of the trunk* is shorter. The color is brown to tawny.

The endopatagium and mesopatagium is nearly one-half covered with soft hairs. The back is naked excepting over the sacrum where a few black hairs are found. Hair extends along the dorsal aspect of forearm.

(2) (*b, c & d.*) The same as above excepting that the hair over the sacrum is present in a well-defined clump and extends upward one-third the length of the back.

(3) (*e.*) Fur soft, short, appressed. Front of neck, nearly naked; the front of trunk quite so. The sorrel clump is well developed. A faint but easily discernible longitudinal stripe extends the entire length of the back. The dorsal aspect of the humerus is covered with short hair. The hair over the forearm is more marked than in the larger and more mature specimens.

Harpyia major.

Nine examples adult; sex unknown.

Crown to back of eyes unicolorous, erect white-gray compact hair.

Crown to occiput the same with base plumbeous.

Side of face without differentiation unicolorous tawny, hair fuller and longer in front of the ear.

Side of neck with long, relatively coarse hair—gray nearly entire length, but having rusty brown tips. Front of neck almost naked.

Back of neck with soft, shorter hair, the base is very dark, with gray tips.

Side of trunk scarcely at all different from the front.

Back of trunk—gray in color, long, erect, with basal two-thirds black. The black vertebral stripe does not extend beyond level of prebrachium. Endopatagium with hem of hair on dorsal surface. Interfemoral membrane naked beneath, sparsely covered in great part on dorsal surface with short, inconspicuous hair of the same color as that of the back.

Cynopterus marginatus.

Three specimens were examined, all adults—two males and one female.

In one of the males the *crown* and *face* were mouse-gray. No evidence of a "whisker" was present. The hair of the space between the horizontal rami of the mandible was of different texture from that of the face. The hair was longer and thinly covered the skin.

The *side of the neck* without radiating hairs. The color of this region not differing from that of the front of the trunk which was slate-gray. The region of the mamma slightly rufous.

The *side of the trunk* below the mamma with longer hair than that of the front but otherwise is not differentiated. That below the

anus is continuous with the line last named but is of a more rusty tinge.

The *hair of the back* is longer than that of the front. There is no mantle. The hair is slightly woolly over *sacrum* and on the thighs.

The fur is everywhere unicolored.

The second male like the foregoing, but the sides of the neck with long coarse radiating rusty red hair. This color dominates the front of the neck. The same colored but softer hair marks the position of the mamma.

The *infra-anal region* was gray.

The single example of a female was the same as the above, excepting that the rusty hue of the mamma dominates the color of the side of the trunk and the rusty hue of the side of the neck extends less evidently on the front.

The differentiation of the region of the mamma is noteworthy in this species. The hair on the side of the neck, according to Dobson, is more rusty in the males during the rutting season than at other times. The region also may be of secondary sexual significance. It will be noted that the color in the single female scarcely differs from that of the male. To a less degree than in any form examined were the regions of the head and face distinguished.

The distribution of the hair in families other than the Pteropodidæ is not subject to the same sharp contrasts of color, nor to the same variety within specific limits. The subject, however, is worthy of extended study. As a rule the disposition to the sides of the neck and body being more heavily furred than elsewhere is evident.

In *Chalinolobus* (as remarked by Dobson¹) the fur of the head and shoulders is darker than the rest of the body. *Atalapha cinerea* exhibits the same disposition for the hair in front of the ear and of the inter-ramal space to be darker than the adjacent regions as is noted in some species of *Pteropus*. In the young of *Atalapha noveboracensis* while the head and back including the corresponding aspect of the interfemoral membrane is uniformly clothed, the under surfaces of the head, neck, trunk and interfemoral membrane are naked. In *Artibeus* and *Carollia* an attempt at special dispositions of hair about the eye is clearly discernible. As is well known a white dorsal stripe on the head and back of *Artibeus* and on the

¹ Catalogue of Cheiroptera in the British Museum.

back in *Noctilio*, are met with. In *Chilonycteris davyi* the back of the trunk is naked as in *Cephalotes* and *Notopterus*.

In *Vesperugo lasiopterus* the disposition for hair to grow along the lines of the raised folds of the wing membranes is evident. The basal clump of hair which is so commonly present in *Vespertilionidæ* appears to correspond to those caudal vertebræ which are in axial line with the trunk.

In the *Pteropodidæ* the arrangement of the verrucæ is not of the importance assumed in other families. Thus in the last named, the rictal wart may separate the facial from the inter-ramal regions. The same structure apparently determines the direction of the auricular expanse forward. The mental warts in like manner forecast the positions of mental leaflets in *Noctilio*, *Chilonycteris* and *Mormops*. The region of the warts at the side of the muzzle becomes the site of remarkable outgrowths in *Synotus* and *Corynorhinus*. In *Molossus rufus* a group of hair-bearing verrucæ limits the area of distribution of the hair on the dorsum of the interfemoral membrane. Special patches of hair are met with on the same surface in the female of *Miniopterus schreibersii*.*

For the opportunity of examining the material upon which the study of the *Pteropodidæ* is based I am indebted, in great part, to the courtesy of Mr. F. A. Ward of Ward's Natural History Establishment, Rochester, N. Y.

* Proc. Acad. Nat. Sci., 1889, p. 322.